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The Specific Distinctness of the Fiddler Crabs *Uca pugnax* (Smith) and *Uca rapax* (Smith) at Their Zone of Overlap in Northeastern Florida[1]

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(Plate I)

THE fiddler crab *Uca pugnax* (Smith), has been described as ranging from the northeastern United States to the southern coast of Brazil near Rio de Janeiro. Systematically, this species is currently divided into three subspecies: the northern, nominate race extending from Cape Cod, Massachusetts, to southern Florida (?); the southern race, *rapax,* from southern Florida to Angra dos Reis, Brazil; and a localized race, *brasiliensis,* from Baía de Guanabara, Brazil. *Uca pugnax* and *Uca rapax* were originally described as separate species (Smith, 1870) and later reduced to subspecies by Rathbun (1901, 1918). The form *brasiliensis* (Oliveira, 1939) may have been based on aberrant individuals (Jocelyn Crane, personal communication) and is therefore of doubtful validity. On the basis of evidence to be presented in this paper, the forms *U. p. pugnax* and *U. p. rapax* apparently should be restored to full specific status, and will therefore be designated in the following pages as *U. pugnax* and *U. rapax.*

We are very thankful to Miss Jocelyn Crane of the New York Zoological Society for her many helpful suggestions during this study as well as for having critically read the manuscript.

Distribution in Northeastern Florida

Although the eastern coast of Florida has been arbitrarily designated as the most probable region where the northern and southern subspecies of *Uca pugnax* intergrade, the actual area has never been studied. In the course of a preliminary survey of the ecology of fiddler crabs from the Atlantic coast of the Americas, the authors visited the eastern coast of Florida in July of 1957 for the purpose of establishing, if possible, the area of supposed intergradation between the two forms.

It was believed that the northern Indian River region of east-central Florida would be a good point from which to begin observations. Here, at the town of Shiloh, the forms all proved to be typical *U. rapax.* Collections were then made progressively north of Shiloh at New Smyrna Beach, Flagler Beach, Crescent Beach, Vilano Beach and Jacksonville Beach. *U. rapax* was found from New Smyrna Beach to Crescent Beach, and *U. pugnax* from Crescent Beach north. From these findings it can be seen that the two forms meet in the general region of Crescent Beach which is located some ten miles south of St. Augustine, Florida.

It is interesting to note that another tropical fiddler crab, *Uca thayeri,* was found as far north as Vilano Beach, immediately northeast of St. Augustine, thus paralleling the northern extension of *U. rapax.*

The question now arises as to whether there is any evidence of intergradation, or do two distinct species overlap where the ranges meet? In order to clarify this point, the following observations were made on the forms from the Crescent Beach region and adjacent areas.

Ecology

The forms of *U. rapax* at Crescent Beach were all found above the high tide level in sandy soil with tall grass cover, whereas *U. pugnax* was seen in situations approximating those of northern regions, that is, in relatively open, intertidal

[1]This study was supported by a grant from the National Science Foundation (G-2509).

mud flats. During some two hours of observation at Crescent Beach we saw no indication of overlap between these two forms; *Uca pugilator*, however, characteristically an intertidal species of the open sandy beach, was seen to overlap *U. pugnax* much as it does in other areas where their habitats adjoin. The *U. rapax* which we had observed at Key Biscayne (five miles south of Miami, Fla.), Flagler Beach, New Smyrna Beach and Shiloh were almost invariably found in sandy habitats with grass or mangrove cover. Although Crane (1943a) found *U. rapax* from Venezuela often frequenting a sandy or pebbly habitat, either in the open or among grass tussocks, it should be borne in mind that *U. rapax* from the Caribbean region (Venezuela, Jamaica and Trinidad) has been observed by the authors and Miss Crane more typically to inhabit either muddy or sandy mud situations.

Size

The *U. pugnax* taken and observed by us at Crescent Beach, Jacksonville Beach and Vilano Beach averaged much smaller than typical *U. pugnax* from more northern areas (Table 1). It would seem that there is a tendency toward a decrease in size for *U. pugnax* at the southern limit of its range. *U. rapax*, however, from the northern limits of its range does not appear to exhibit a correspondingly marked decrease in size. Truly tropical *U. rapax* does nevertheless average larger than any of the Florida forms observed; we have recorded maximum weights of 8.5 gms. from Trinidad and 13.5 gms. from Jamaica, B.W.I.

Color

On the basis of color, the *U. pugnax* from Crescent Beach could be readily separated from the *U. rapax* with no evidence of integradation. The *U. pugnax* specimens all had the dark greenish-olive carapace of typical *pugnax* with the characteristic frontal blue area between the ocular peduncles. The major cheliped (large claw) of the male was also typically *pugnax* in having the palm (hand) lighter olive green than the carapace with light brownish-yellow at the articulations and the fingers light yellow.

All the specimens of *U. rapax* from Crescent Beach possessed the characteristic coloring of that form, the ground color of the carapace being a creamy or dusky white with the posterior quarter usually dark vinaceous brown and the remainder mottled variously with grayish or brownish patterns, varying from very sparse mottling to a solid dark brown. Light reddish spotting in the frontal region was quite often apparent between the ocular peduncles. The ground color of the major cheliped was a light apricot orange, mottled or diffused with light brown on the propodus and becoming white or creamy white on the fingers. The legs varied from brownish-white to dark reddish or vinaceous brown. The description of *U. rapax* by Crane (1943a) from Venezuela agrees closely with our Florida material, thus showing good homogeneity of coloration within that form.

Morphology

One of the most obvious differences between the males of the two forms is the relatively chunky appearance of the major cheliped of *U. rapax* as compared to the generally more slender claw of *U. pugnax*. Representative claws from both typical and overlap populations are figured in Plate I. The length of the entire propodus in *U. rapax*, as measured from the tip of the immovable finger to the proximal edge, is usually less than twice the length of the palm, as measured from the lower point of articulation with the movable finger to the proximal edge. Table 1 gives the ratios of the palm length to the propodus length for some of the populations studied. About 80 per cent. of the 37 males of the *pugnax-rapax* assemblage at Crescent Beach, with ratios greater than 2.0, could be separated as *U. pugnax*, and about 88 per cent. of those with ratios less than 2.0 could be separated as *U. rapax*.

There is also a tendency to have the fingers of the major cheliped in *U. rapax* shorter and less slender than in *U. pugnax*, with the distal fourth of the immovable finger invariably curved up, whereas in *U. pugnax* it is most often straight or even curving slightly down.

Other differences, such as the angle of the eyebrow and variations in the granulation of the inner surface of the palm, have been discussed by Rathbun (1918).

Behavior

Crane (1943b) has described the display waving of the large claw in the males of *U. pugnax* and *U. rapax* as being quite distinctive. We have likewise observed this difference, which becomes markedly apparent when the two forms are seen displaying side by side in laboratory aquaria. Miss Crane further remarks (personal communication) that "an outstanding fact concerning all other widespread fiddler species has proved to be the constancy of their display characteristics throughout their range, along with the absence of any noticeable tendency to subspeciate."

Table 1. Ratio of Length of Palm to Propodus in the Major Cheliped of *Uca pugnax* and *Uca rapax* from Several Populations

Locality and Form	Sample Size	Range in Length of Propodus (mm.)	Propodus Length* / Palm Length	
			Range	Mean ± S.E.
Beaufort, N. C. (*U. pugnax*)	50	14.8-44.3	1.72-2.43	2.12 ± .023
Jacksonville Beach, Fla. (*U. pugnax*)	23	16.5-29.7	1.72-2.38	2.12 ± .020
Crescent Beach, Fla. (*U. pugnax*)	19	10.9-27.4	1.87-2.31	2.06 ± .023
Crescent Beach, Fla. (*U. rapax*)	18	22.7-35.4	170-2.04	1.86 ± .020
Shiloh, Fla. (*U. rapax*)	18	10.8-34.2	1.50-1.91	1.77 ± .028
Key Biscayne, Fla. (*U. rapax*)	50	13.1-38.4	1.62-2.08	1.85 ± .016
Jamaica, B.W.I. (*U. rapax*)	34	14.4-33.7	1.61-2.15	1.94 ± .022

*See text for exact limits of measurement.

Summary and Conclusions

Because of the lack of any color, morphological or behavioral intergradation between the northern (nominate) and southern (*rapax*) subspecies of the fiddler crab, *Uca pugnax*, in the region where the two forms come together in northeastern Florida, it appears evident that the two forms are actually separate species rather than subspecies as had been previously thought. In view of this evidence, therefore, the name *Uca pugnax* (Smith) is retained for the species ranging from Cape Cod, Massachusetts, to the St. Augustine region of northeastern Florida, and the species ranging from northeastern Florida to Angra dos Reis, Brazil, then becomes *Uca rapax* (Smith).

Literature Cited

Crane, J.

1943a. Crabs of the genus *Uca* from Venezuela. Zoologica, 28: 33-44.

1943b. Display, breeding and relationships of the fiddler crabs (Brachyura, genus *Uca*) in the northeastern United States. Zoologica, 28: 217-223.

Oliveira, L. P. H. de

1939. Contribuicao ao conhecimento dos crustaceos do Rio de Janeiro. Mem. Inst. Oswaldo Cruz Rio de J., 34: 115-148.

Rathbun, M. J.

1901. The Brachyura and Macrura of Porto Rico. Bull. U. S. Fish Comm. for 1900, 20: 1-137.

1918. The Grapsoid Crabs of America. Spec. Bull. U. S. Nat. Mus., No 97, 1-461.

Smith, S. F.

1870. Notes on American crustacea. No. 1. Ocypoidea. Trans. Conn. Acad., 2: 113-176.

EXPLANATION OF THE PLATE

Plate I

Fig. 1. Major cheliped of *Uca pugnax* from Beaufort, North Carolina.

Fig. 2. Major cheliped of *Uca pugnax* from Crescent Beach, Florida.

Fig. 3. Major cheliped of *Uca rapax* from Crescent Beach, Florida.

Fig. 4. Major cheliped of *Uca rapax* from Shiloh, Florida.